Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of: Amendment of Part 25 of the Commission's Rules To Adopt Licensing and Service Rules for Aeronautical Mobile-Satellite Service ("AMSS") Operations in the Ku-Band.	)	RM No. 10800

To: The Commission

COMMENTS OF THE BOEING COMPANY

The Boeing Company ("Boeing"), by its attorneys, hereby files these brief comments in support of its Petition for Rulemaking ("Petition") in the above-captioned proceeding. The Petition sets forth detailed proposals for the licensing of Aeronautical Mobile-Satellite Service ("AMSS") operations in the 14.0-14.5 GHz (uplink) and 11.7-12.2 GHz (downlink) bands (collectively, the Ku-band), as well as the provision of domestic and international AMSS in the Ku-Band.[1] These comments are limited to a few specific proposals contained in the Petition.

As the Commission is aware, Boeing is the leading proponent of real-time, two-way advanced broadband satellite communications services for commercial, government and private aircraft customers through its Connexion by Boeing[sm] ("Connexion") service. As set forth in the Petition, Boeing already has achieved significant commercial progress

[1] *See Petition for Rulemaking*, Amendment of Parts 2 and 25 of the Commission's Rules To Allocate Spectrum in the 14-14.5 GHz Band to the Aeronautical Mobile-Satellite Service ("AMSS") and To Adopt Licensing Rules for AMSS Operations in the Ku-Band, filed by The Boeing Company (July 21, 2003). In placing this Petition on Public Notice, the Commission indicated that it is only seeking comments on the proposed Part 25 rule changes concerning licensing and service rules, and that the proposed AMSS allocation changes will be addressed in ET Docket No. 02-305. *See Public Notice,* Consumer & Governmental Affairs Bureau, Reference Information Center, Petition for Rulemaking Filed, Report No. 2632 (Oct. 2, 2003).

in launching this new broadband service, with the signing of several international airline carriers, such as Lufthansa, Scandinavian Airlines System ("SAS") and All Nippon Airways ("ANA") to install Connexion service on their long-haul aircraft,[2] and has teamed with Rockwell Collins to bring high-speed connectivity to the business aviation market.[3] In addition, Boeing has recently entered into agreements with several satellite operators to extend its Connexion service around the world.[4]

In developing the Connexion service, Boeing has devoted substantial resources to establishing the technical basis, operational infrastructure and regulatory framework, as well as the business case, for broadband communications to aircraft. Boeing believes that there is strong current and future demand for AMSS services generally, and for broadband services in particular. There are 13,000 jetliners in the global commercial aircraft fleet today; in 2012, there will be 21,000. According to market research conducted by Boeing and others, 50 percent of airline travelers have a strong interest in in-flight email and Internet access, and 60 percent said they would be willing to pay for it. In addition, 75 percent of business travelers carry laptops in-flight, and 62 percent of U.S. frequent business travelers are either "extremely" or "very" interested in Connexion broadband services. Thus, there plainly is a substantial and growing

[2] The Boeing Company, *News Release* (Sept. 9 2003) (available at <http://www.boeing.com/news/releases/2003/q3/nr_030909j.html>).

[3] The Boeing Company, *News Release* (Oct. 7, 2003) (available at http://www.boeing.com/news/releases/2003/q4/nr_031007j.html>).

[4] The Boeing Company, *News Release* (Sept. 12, 2003) (Intelsat) (available at <http://www.boeing.com/news/releases/2003/q3/nr_030912j.html>); The Boeing Company, *News Release* (Aug. 28, 2003) (SCC) (available at <http://www.boeing.com/news/releases/2003/q3/nr_030828j.html>); The Boeing Company, *News Release* (Aug. 26, 2003) (Eutelsat) (available at <http://www.boeing.com/news/releases/2003/q3/ nr_030826j.html>).

market for broadband services on aircraft.[5]

While Boeing is the only licensee in the United States authorized to provide commercial two-way broadband services to aircraft in the Ku-band,[6] other service providers plan to offer similar types of services. Indeed, approximately two months ago, Aeronautical Radio Inc. ("ARINC") filed an application with the Commission for blanket authority to operate aboard aircraft up to 1000 transmit/receive mobile earth stations in the Ku-band to provide domestic AMSS services.[7] The existence of another U.S. provider seeking to offer Ku-band AMSS services in the United States, and the potential for additional competition from other U.S. and foreign providers, confirms the need for uniform licensing and service rules to regulate this service.

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[5] As a separate matter, the Commission is undertaking a review of its rules governing the commercial air-ground radiotelephone service operating in the 849-851 MHz and 894-896 MHz bands. *See* In the Matter of Amendment of Part 22 of the Commission's Rules To Benefit the Consumers of Air-Ground Telecommunications Services, Biennial Regulatory Review—Amendment of Parts 1, 22, and 90 of the Commission's Rules, *Notice of Proposed Rulemaking*, File No. WT Docket No. 03-103, FCC 03-95 (rel. April 28, 2003) ("*ATG NRPM*"). While that rulemaking proceeding is not related to the adoption of Ku-band AMSS licensing and service rules, the *ATG NPRM* does recognize that there is a need for Commission action to promote new and innovative communications offerings for aircraft passengers. *See, e.g., id.*, ¶ 5.

[6] *See* Radio Station Authorization, Call Sign E000723, File No. SES-MOD-20020308-00429; *see also The Boeing Company,* Order and Authorization, 16 FCC Rcd. 22645 (Int'l Bur./OET 2001) (blanket license to operate 800 phased array antenna earth stations on-board aircraft within the United States). A modification application to substitute 675 phased array antennas with a like number of reflector antennas with improved operational characteristics remains pending before the Commission. *See* Boeing Application to Modify Blanket Authorization to Operate up to Eight Hundred Technically Identical Transmit and Receive Mobile Earth Stations Aboard Aircraft in the 11.7-12.2 and 14.0-14.5 GHz Frequency Bands, File No. SES-MOD-20030512-00639 (filed May 12, 2003).

[7] *See* In the Matter of Aeronautical Radio Inc. Application for Blanket Authority to operate Aboard Aircraft Up To 1000 Technically-Identical Transmit and Receive Mobile Earth Stations in the 11.7-12.2 and 14.0-14.5 GHz Frequency Bands, File No. SES-LIC-20030910-01261, Call Sign E030205 (Public Notice, Report No. SES-00541 (Oct. 15, 2003)).

At least two fundamental principles should guide the Commission's development of rules for AMSS operations: (i) ensure that all AMSS providers in the Ku-band compete on a level regulatory playing field; and (ii) use lessons learned in past licensing proceedings to streamline the AMSS regulatory regime, while at the same time affording adequate protection to co-frequency operations in the Ku-band. Boeing addresses these principles more fully below.

I. AMSS LICENSING AND SERVICE RULES SHOULD CREATE A LEVEL REGULATORY PLAYING FIELD FOR APPLICANTS

In its Petition, Boeing did not specifically address the possibility of multiple entry of AMSS providers in the Ku-band. At the time, it was the only AMSS licensee authorized by the Commission and no other application for AMSS operations in the Ku-band was before the Commission. The rules that Boeing has proposed, however, are equally applicable to a multiple entry environment. Of course, to preserve the opportunity for multiple entry, the Commission must ensure that its AMSS licensing and service rules are applied evenhandedly in order to create a level regulatory playing field for all applicants and licensees.

There is no doubt that multiple AMSS entrants can be accommodated in the Ku-band. Based on the extensive technical and regulatory work that resulted in the adoption of Recommendation ITU-R M.1643 ("Technical and operational requirements for aircraft earth stations of the aeronautical mobile-satellite service including those using fixed-satellite service networks in the band 14-14.5 GHz (Earth-to-space)") by the ITU-R's 2003 Radiocommunication Assembly and a global secondary allocation for AMSS services in the 14.0-14.5 GHz band by the 2003 World Radiocommunication Conference ("WRC-03"), properly designed Ku-band AMSS systems -- such as the Connexion system -- will be able to share spectrum with all co-frequency operations, including other AMSS systems in the Ku-band. Indeed, because these AMSS systems use FSS satellite transponders to provide service in the Ku-band, and because

AMSS systems protect co-frequency FSS operations by controlling the aggregate off-axis e.i.r.p. levels produced by all aircraft earth stations ("AESs") using an FSS satellite transponder to a level no greater than that accepted by neighboring FSS satellites for typical earth stations of the serving satellite, AMSS operations *necessarily* permit multiple entry using different transponders or satellites. In other words, because competing AMSS systems typically will provide service using different FSS transponders or satellites in accordance with previously coordinated interference parameters, there should not be any potential for harmful interference among AMSS providers.[8]

The proposed AMSS rules set forth in the Petition will also ensure that other co-frequency FSS operations in the Ku-band are protected from harmful interference. As discussed more fully in the following section, the proposed AMSS rules are based on the licensing conditions imposed by the Commission in authorizing the transmit and receive operations of the Connexion system, as well as the AMSS operational guidelines contained in Recommendation ITU-R M.1643. These requirements were developed and adopted after years of careful consideration and study by the interested industry participants, government regulators and the ITU, and reflect the methods agreed upon by the international community to operate AMSS systems in the Ku-band. Indeed, working closely with Boeing, the Commission and other U.S. government departments championed the efforts to adopt the technical guidelines (and the international spectrum allocation) necessary to facilitate AMSS operations in the Ku-band. The Commission's adoption of these requirements as AMSS licensing and service rules is the logical

[8] Indeed, there should be no harmful interference even if the same satellite is used by multiple AMSS operators so long as different transponders are being used to provide the broadband service to aircraft.

extension of the United States' successful efforts within the ITU, and will help facilitate bringing the significant benefits of AMSS services to U.S. consumers.

II. THE COMMISSION SHOULD ADOPT A STREAMLINED AUTHORIZATION PROCESS FOR AMSS SYSTEMS THAT FULLY PROTECTS CO-FREQUENCY OPERATION IN THE KU-BAND

Commission should benefit from the vast knowledge gained in licensing the Connexion service, and in the ITU-R study group process to develop licensing and operational guidelines for Ku-band AMSS systems, and to adopt rules which can streamline the authorization process for all proposed AMSS systems in the Ku-band.

A. The AMSS Licensing and Service Rules Proposed in the Petition Fully Protect Co-Frequency Operations in the Ku-band

The AMSS rules proposed in the Petition, which are based on the licensing conditions imposed by the Commission in authorizing the Ku-band transmit/receive operations of the Connexion system and on Recommendation ITU-R M.1643, fully protect co-frequency operations in the Ku-band. Adoption of these rules will streamline the licensing of proposed AMSS systems, and ensure that AMSS operators can share spectrum successfully with other authorized users of the Ku-band.

In December 2001, the Commission authorized Boeing to operate 800 transmit/receive AESs on an unprotected, non-harmful interference basis.[9] In particular, the Commission concluded that Ku-band AMSS operations would not cause harmful interference into primary GSO FSS operations so long as the aggregate off-axis e.i.r.p levels of AES uplink operations along the GSO arc are maintained below the level produced by routinely processed VSAT earth

[9] *See The Boeing Company,* Order and Authorization, 16 FCC Rcd. 22645 (Int'l Bur./OET 2001) ("*Transmit-Receive Order*").

stations pursuant to Sections 25.134 and 25.209 of the Commission's rules.[10] The AMSS rules proposed in the Petition seek to apply for all future AMSS systems the requirements previously imposed on Connexion's AMSS operations.

This approach to protecting co-frequency Ku-band FSS operations, which also is embodied in ITU-R Recommendation M.1643, will ensure that AMSS systems will not cause harmful interference into Ku-band FSS satellites. Indeed, while the Commission has heretofore authorized AMSS operations on a non-conforming use basis only, future AMSS operations will have the enhanced regulatory status of secondary service in the 14.0-14.5 GHz band (a secondary AMSS allocation in the band has been adopted internationally and is currently pending before the Commission). The operational conditions necessary for the Commission to authorize Connexion's non-conforming transmit/receive AMSS operations nearly two years ago are plainly sufficient to ensure that secondary AMSS operations do not cause harmful interference to Ku-band FSS systems.[11] Strict imposition of these operational conditions on all AMSS systems will allow the Commission to routinely license Ku-band AMSS systems, while at the same time ensuring that Ku-band FSS operations are fully protected.

Other requirements in the AMSS rules proposed by Boeing are designed to protect other authorized users of the 14.0-14.5 GHz band, including the Radio Astronomy Service and the Space Research Service, and are similarly based on the licensing conditions included in prior Commission authorizations and the operational guidelines set forth in Recommendation ITU-R

[10] *See id.*

[11] Boeing notes that it has not received a single complaint of interference from any FSS satellite operator since it commenced the Connexion system's transmit/receive operations.

M1643. Thus, the Commission can be assured that all Ku-band AMSS systems will be able to share spectrum successfully with other authorized users of the Ku-band.

In addition to ensuring protection of co-frequency services and allowing routine licensing of AMSS systems, applying the licensing and service rules evenly and fairly to all AMSS operators will ensure that all AMSS providers operate on an equal regulatory footing and a level playing field. Imposing less restrictive conditions on some operators but not others could give an unfair advantage and cause distortions in the fledgling AMSS market.

B. Protection of Terrestrial Fixed Services Outside the United States

As noted in the Petition, because there are no allocations for terrestrial fixed service ("FS") operations in the 14.0-14.5 GHz band in the United States or in any bordering countries, the Commission need not adopt specific rules governing domestic AMSS operations to protect co-frequency FS stations. However, AMSS providers operating in international airspace near territories with co-frequency FS operations should protect such operations from harmful interference.

As U.S.-licensed AMSS providers will operate on a secondary basis, they must protect primary FS operations outside the United States from harmful interference.[12] Thus, as an AES approaches the airspace of a foreign country with co-frequency FS operations, an AMSS provider may protect the primary FS operations by using techniques such as power control or frequency avoidance. Alternatively, the AMSS provider may be able to negotiate a different sharing arrangement as part of the licensing process in a foreign country or in coordination with a potentially affected administration.

[12] Although such a requirement is inherent in the secondary status of the AMSS allocation, it is underscored by new country footnotes Nos. 5.504C, 5.508A and 5.509A in the International Table of Frequency Allocations contained in the Radio Regulations.

Boeing acknowledges, however, that it would be useful for the Commission to include in its AMSS service rules specific operational requirements to protect co-frequency FS operations abroad in the absence of a specific agreement with a potentially affected administration. In this regard, Recommendation ITU-R M.1643 includes provisions for protecting FS stations from harmful interference by co-frequency AMSS operations.[13]

Accordingly, Boeing proposes that the provisions set forth in Recommendation ITU-R M.1643 to ensure the protection of co-frequency FS operations be incorporated by reference into the Commission's AMSS service rules and be applied only in the absence of an agreement between a U.S. AMSS licensee and a potentially affected foreign administration, which may be obtained in the context of foreign AMSS licensing or coordination discussions. In circumstances where AMSS operations may potentially affect FS operations in more than one country simultaneously (*e.g.*, aircraft flying near border areas, over narrow bodies of water separating foreign countries, etc.), Boeing proposes that the requirement to be applied should be the most stringent requirement needed to protect a FS station within the jurisdiction of a potentially affected administration. For example, where an AMSS operator has an agreement with one country that is less stringent that the provisions of Recommendation ITU-R M.1643 and but has no agreement with a second potentially affected administration, then the AMSS operator must comply with Recommendation ITU-R M.1643. Similarly, if an AMSS operator has different agreements with two or more administrations that could be potentially affected simultaneously, then it must comply with the most stringent of those agreements.

To this end, Boeing would suggest adding a new Section 25.216(b)(3) to its proposed

[13] *See* Recommendation ITU-R M.1643 at Annex 1, Part B. The Recommendation includes a pfd mask at various angles of arrival that would be obtained under free-space propagation conditions to protect FS operation. An e.i.r.p mask can be derived from the pfd mask by applying the method given in Annex 2 of the Recommendation. *Id.* At Annex 2.

AMSS service rules:

> Section 25.216(b)(3). When operating co-frequency with terrestrial fixed service (FS) stations within the line of sight of the territory of a foreign Administration that has a primary FS allocation in the 14.0-14.5 GHz band, the operations of an AES shall be in accordance with Annex 1, Part B of the latest version of Recommendation ITU-R M.1643, unless the foreign Administration has imposed other conditions for protecting its FS stations. Such alternative conditions may be included in the authorization of the AMSS network to operate within the territory of a foreign Administration or pursuant to a coordination agreement with the foreign Administration governing the operations of the AMSS network.

Boeing would note that the Commission's rules contain numerous references to ITU regulations and recommendations, and that incorporating by reference the provisions of Recommendation ITU-R M.1643 relating to protection of co-frequency FS services is consistent with past Commission practice. For example, Section 25.146 of the rules provides that GSO/NGSO sharing calculations must be in accordance with ITU-R Rec.BO.1503, even though the substantive GSO/NGSO sharing criteria are included in the Part 25 rules.[14] Similarly, Section 25.114(c)(22) of the rules provides that DBS applications must contain information required by Appendix 30 and 30A of the International Radio Regulations. More recently, in a decision addressing Part 80 maritime services, the Commission specifically incorporated ITU-R technical recommendations by reference to govern licensed maritime operations.[15] Thus, there is little doubt that the Commission can incorporate portions of Recommendation ITU-R M.1643 into its AMSS service rules as proposed by Boeing.

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[14] *See* 47 C.F.R. §§ 25.146, 25.208.

[15] *See* In the Matter of Amendment to Part 13 and 80 of the Commission's Rules Concerning Maritime Communications, *Report and Order and Further Notice of Proposed Rulemaking*, WT Docket No. 00-48, RM-9499, FCC 02-102 (rel. Apr. 9, 2002) (new sections 80.103(c), 80.179(e)(1), 80.219 and §80.225 (explicitly stating that references to ITU-R Recommendations are to the most recent version of such Recommendations)).

III. CONCLUSION

For all of the reasons set forth herein and in its original Petition, Boeing respectfully requests that the FCC initiate a rulemaking proceeding to adopt licensing and service rules for AMSS operations in the Ku-band so that significant benefits of this innovative broadband communications service can be realized more fully in the United States and around the world.

Respectfully submitted,

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